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Bibliography

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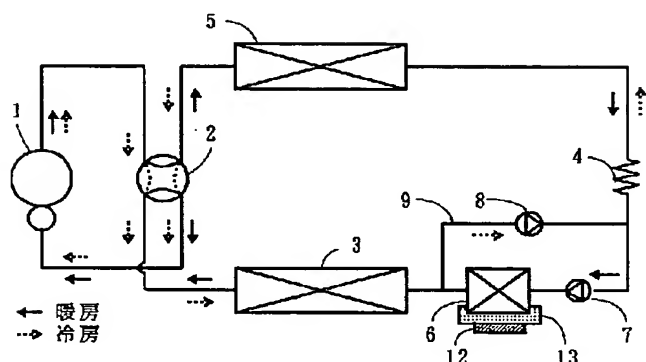
## Epitome

### (57) [Abstract]

[Technical problem] An auxiliary outdoor heat exchanger is prepared in an outdoor heat exchanger and a serial, this auxiliary outdoor heat exchanger is heated using exhaust heat of an inverter controlling element, and the air conditioner which can increase the amount of heat exchange at the time of heating operation is offered.

[Means for Solution] Carry out sequential connection of a compressor 1, a four way valve 2, an outdoor heat exchanger 3, an expansion valve 4, and the indoor heat exchanger 5, constitute a refrigerating cycle, and set to the air conditioner which becomes the power module 12 which generates heat at the time of actuation in a compressor 1 and the outdoor unit which holds outdoor heat exchanger 3 grade, and this power module 12 from the heat sink 13 which carried out heat association. Between an outdoor heat exchanger 3 and an expansion valve 4, series connection of the auxiliary outdoor heat exchanger 6 and the 1st closing motion valve 7 is carried out. Between the 1st closing motion valve 7 and said expansion valve 4 between an outdoor heat exchanger 3 and the auxiliary outdoor heat exchangers 6 While connecting the bypass way 9 through the 2nd closing motion valve 8, heat association of the heat sink 13 is carried out with the auxiliary outdoor heat exchanger 6, and at the time of heating operation, the 1st closing motion valve 7 is opened, the 2nd closing motion valve 8 is closed, and it controls like.

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## CLAIMS

### [Claim(s)]

[Claim 1] Compressor Four way valve Outdoor heat exchanger Expansion valve The heat sink which carried out sequential connection of the indoor heat exchanger, and carried out heat association at the power module which constitutes a refrigerating cycle, is equipped with the inverter control circuit which controls the drive of

this compressor in the outdoor unit which holds said compressor, outdoor heat exchanger, etc., and constitutes this inverter control circuit, and this power module. While being the air conditioner equipped with the above and carrying out series connection of an auxiliary outdoor heat exchanger and the 1st closing motion valve between said outdoor heat exchangers and said expansion valves. Between said 1st closing motion valves and said expansion valves between said outdoor heat exchangers and said auxiliary outdoor heat exchangers. While connecting a bypass way through the 2nd closing motion valve, it considers as the configuration which carried out heat association of said heat sink with said auxiliary outdoor heat exchanger. It is characterized by controlling and becoming at the time of heating operation, so that may open said 1st closing motion valve, said 2nd closing motion valve may be closed, said 1st closing motion valve may be closed at the time of air conditioning operation and said 2nd closing motion valve may be opened.

[Claim 2] The air conditioner according to claim 1 characterized by making the radiation fin of said auxiliary outdoor heat exchanger come to carry out heat association of said heat sink.

[Claim 3] The air conditioner according to claim 1 characterized by coming it below one half of said outdoor heat exchanger to carry out heat exchange capacity of said auxiliary outdoor heat exchanger.

[Claim 4] The air conditioner according to claim 1 characterized by coming to use a check valve or a solenoid valve for said each closing motion valve.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention heats the auxiliary outdoor heat exchanger prepared in the exterior unit using exhaust heat of the heat sink of an inverter control circuit, and relates to the air conditioner which can increase the amount of heat exchange at the time of heating operation.

[0002]

[Description of the Prior Art] The conventional air conditioner carries out sequential connection of a compressor 1, a four way valve 2, outdoor heat exchanger 3', an expansion valve 4, and indoor heat exchanger 5', as shown, for example in drawing 4, and the refrigerating cycle is constituted. By the above-mentioned configuration, a continuous-line arrow head shows the flow direction of the refrigerant at the time of heating operation among drawing 4, and the broken-line arrow head shows the flow direction of the refrigerant at the time of air conditioning operation by it. In the above-mentioned air conditioner, after it passes a four way valve 2, the gas refrigerant of elevated-temperature high pressure breathed out from the compressor 1 in an exterior unit at the time of heating operation is carrying out heat exchange to indoor air, while flowing indoor heat exchanger 5', is condensate-ized, and emits and condenses heat indoors. The liquid cooling intermediation condensed and liquefied is decompressed through an expansion valve 4, serves as a vapor-liquid two phase of low-temperature low voltage, while flowing outdoor side heat exchanger 3', from outdoor air, endoergic [ of it ] is carried out and it evaporates, it turns into a gas refrigerant of low-temperature low voltage, and is returned to a compressor 1 from a four way valve 2. At the time of air conditioning operation, an operation of outdoor, indoor heat exchanger 3', and 5' becomes reverse by switching a four way valve 2, and also it is the same as the case of heating.

[0003] However, in the above-mentioned configuration, since evaporation of the refrigerant which flows outdoor side heat exchanger 3' at the time of heating operation was performed by only the convection current with outdoor air, it was difficult to increase the amount of heat exchange in an exterior unit.

[0004]

[Problem(s) to be Solved by the Invention] This invention was made in view of the above-mentioned trouble, prepares an auxiliary outdoor heat exchanger in an outdoor heat exchanger/a serial, heats this auxiliary outdoor heat exchanger using exhaust heat of the heat sink of an inverter control circuit, and aims at offering the air conditioner which can increase the amount of heat exchange at the time of heating operation.

[0005]

[Means for Solving the Problem] It is what was made in order that this invention might solve the above-mentioned technical problem. A compressor and a four way valve, Carry out sequential connection of an outdoor heat exchanger, an expansion valve, and the indoor heat exchanger, and a refrigerating cycle is constituted. The power module which is equipped with the inverter control circuit which controls the drive of this compressor in the outdoor unit which holds said compressor, outdoor heat exchanger, etc., and constitutes this inverter control circuit, In the air conditioner which becomes this power module from the heat sink which carried out heat association, while carrying out series connection of an auxiliary outdoor heat exchanger and the 1st closing motion valve between said outdoor heat exchangers and said expansion valves Between said 1st closing motion valves and said expansion valves between said outdoor heat exchangers and said auxiliary outdoor heat exchangers While connecting a bypass way through the 2nd closing motion valve, it considers as the configuration which carried out heat association of said heat sink with said auxiliary outdoor heat exchanger. Said 1st closing motion valve is opened at the time of heating operation, said 2nd closing motion valve is closed, said 1st closing motion valve is closed at the time of air conditioning operation, and it has composition controlled to open said 2nd closing motion valve.

[0006] Moreover, it has the composition of having made the radiation fin of said auxiliary outdoor heat exchanger carrying out heat association of said heat sink.

[0007] Moreover, it has composition which made heat exchange capacity of said auxiliary outdoor heat exchanger below one half of said outdoor heat exchanger.

[0008] Moreover, it has the composition of having used the check valve or the solenoid valve for said each closing motion valve.

[0009]

[Embodiment of the Invention] The gestalt of operation of this invention is explained to a detail based on the accompanying drawing of an example. In drawing 1 , drawing 2 , and drawing 3 , an outdoor heat exchanger and 4 carry out an expansion valve by indoor heat exchanger, 5 carries out sequential connection of these, and the four way valve which switches the flow of the refrigerant which carries out 1 from a compressor and carries out the regurgitation of 2 from a compressor 1 to compensate for heating operation, air conditioning operation, etc., and 3 constitute the refrigerating cycle.

[0010] In the outdoor unit 10 which holds said compressor 1, outdoor heat exchanger 3, etc., it has the inverter control circuit 14 which controls the drive of the outdoor blower 11 and said compressor 1, and the outdoor unit 10 is constituted from a heat sink 13 which carried out heat association by the power module 12 which constitutes this inverter control circuit 14, and this power module 12.

[0011] While carrying out series connection of the auxiliary outdoor heat exchanger 6 and the 1st closing motion valve 7 between said outdoor heat exchangers 3 and said expansion valves 4 Between said 1st closing motion valves 7 and said expansion valves 4 between said outdoor heat exchangers 3 and said auxiliary outdoor heat exchangers 6 While connecting the bypass way 9 through the 2nd closing motion valve 8, it has [ a / (6b is a heat exchanger tube) / of said auxiliary outdoor heat exchanger 6 / radiation-fin 6] the composition of carrying out heat association, in said heat sink 13. Moreover, the heat exchange capacity of said auxiliary outdoor heat exchanger 6 has composition made into the small capacity of  $1/2 - 1/3$  of said outdoor heat exchanger 3. In addition, it has the composition of having used the check valve or the solenoid valve for said each closing motion valves 7 and 8.

[0012] In the above-mentioned configuration, said 1st closing motion valve 7 is opened at the time of heating operation, said 2nd closing motion valve 8 is closed, and a refrigerant flows, as a continuous-line arrow head shows. The gas refrigerant of elevated-temperature high pressure breathed out from said compressor 1 By carrying out heat exchange to indoor air, while flowing indoor heat exchanger 5 after passing a four way valve 2 It is condensate-ized and becomes liquid cooling intermediation, and after this liquid cooling intermediation expands by the expansion valve 4 and passes the 1st closing motion valve 7, it is sent into said auxiliary outdoor heat exchanger 6 and outdoor heat exchanger 3, from outdoor air, endoergic [ of it ] is carried out, it evaporates, turns into a gas refrigerant, and is returned to a compressor 1 from a four way valve 2. At this time, a refrigerant is heated by exhaust heat from a heat sink 13 in which the auxiliary outdoor heat exchanger 6 carried out heat association at said power module 12, and heat exchange increases.

[0013] An operation of an outdoor heat exchanger 3 and indoor heat exchanger 5 becomes reverse by closing said 1st closing motion valve 7 at the time of air conditioning operation, and opening said 2nd closing motion

valve 8, a refrigerant's flowing said bypass way 9 side, as a broken-line arrow head shows, and switching said four way valve 2, and also it is the same as the case at the time of heating operation.

[0014] As explained above, while carrying out series connection of the auxiliary outdoor heat exchanger 6 and the 1st closing motion valve 7 between said outdoor heat exchangers 3 and said expansion valves 4 Between said 1st closing motion valves 7 and said expansion valves 4 between said outdoor heat exchangers 3 and said auxiliary outdoor heat exchangers 6 While connecting the bypass way 9 through the 2nd closing motion valve 8, it becomes the air conditioner which can increase the amount of heat exchange at the time of heating operation by carrying out heat association of the radiation-fin 6a of said auxiliary outdoor heat exchanger 6 for said heat sink 13, and considering as the configuration using exhaust heat.

[0015]

[Effect of the Invention] According to this invention, it becomes the air conditioner which can increase the amount of heat exchange at the time of heating operation as mentioned above by preparing an auxiliary outdoor heat exchanger in an outdoor heat exchanger and a serial, carrying out heat association of this auxiliary outdoor heat exchanger with the heat sink which radiates heat in generation of heat from a power module, and using this exhaust heat.

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**DESCRIPTION OF DRAWINGS**

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of the refrigerating cycle of the air conditioner by this invention.

[Drawing 2] It is the outline sectional view of the outdoor unit by this invention.

[Drawing 3] It is the important section expansion perspective view showing the example of this invention.

[Drawing 4] It is the block diagram of the refrigerating cycle of the air conditioner by the conventional example.

[Description of Notations]

- 1 Compressor
- 2 Four Way Valve
- 3 Outdoor Heat Exchanger
- 4 Expansion Valve
- 5 Indoor Heat Exchanger
- 6 Auxiliary Outdoor Heat Exchanger
- 7 1st Closing Motion Valve (Check Valve or Solenoid Valve)
- 8 2nd Closing Motion Valve (Check Valve or Solenoid Valve)
- 9 Bypass Way
- 10 Outdoor Unit
- 12 Power Module
- 13 Heat Sink
- 14 Inverter Control Circuit

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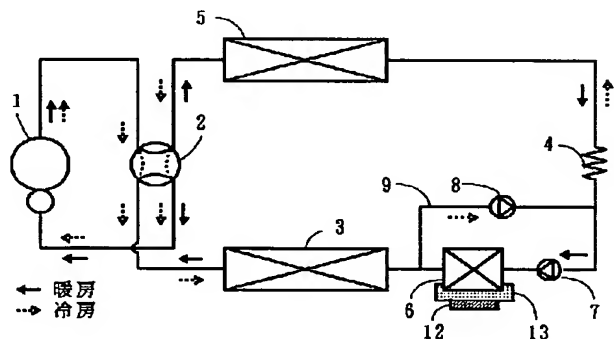
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(54) 【発明の名称】 空気調和機

(57) 【要約】

【課題】 室外熱交換器と直列に補助室外熱交換器を設け、この補助室外熱交換器をインバータ制御素子の排熱を利用して加熱し、暖房運転時の熱交換量を増大することができる空気調和機を提供する。

【解決手段】 圧縮機1と、四方弁2と、室外熱交換器3と、膨張弁4と、室内熱交換器5とを順次連結し冷凍サイクルを構成し、圧縮機1、室外熱交換器3等を収容する室外ユニット内に、作動時に発熱するパワーモジュール12と、このパワーモジュール12に熱結合したヒートシンク13からなる空気調和機において、室外熱交換器3と膨張弁4との間に、補助室外熱交換器6と第1開閉弁7を直列接続し、室外熱交換器3と補助室外熱交換器6との間と、第1開閉弁7と前記膨張弁4との間に、第2開閉弁8を介してバイパス路9を接続する一方、ヒートシンク13を補助室外熱交換器6と熱結合させ、暖房運転時に、第1開閉弁7を開き、第2開閉弁8を閉じように制御する。



## 【特許請求の範囲】

【請求項 1】 圧縮機と、四方弁と、室外熱交換器と、膨張弁と、室内熱交換器とを順次連結し冷凍サイクルを構成し、前記圧縮機および室外熱交換器等を収容する室外ユニット内に、同圧縮機の駆動を制御するインバータ制御回路を備え、同インバータ制御回路を構成するパワーモジュールと、同パワーモジュールに熱結合したヒートシンクとからなる空気調和機において、前記室外熱交換器と前記膨張弁との間に、補助室外熱交換器と第 1 開閉弁を直列接続するとともに、前記室外熱交換器と前記補助室外熱交換器との間と、前記第 1 開閉弁と前記膨張弁との間に、第 2 開閉弁を介してバイパス路を接続する一方、前記ヒートシンクを前記補助室外熱交換器と熱結合させた構成とし、暖房運転時に、前記第 1 開閉弁を開き、前記第 2 開閉弁を閉じ、冷房運転時に、前記第 1 開閉弁を閉じ、前記第 2 開閉弁を開くように制御してなることを特徴とする空気調和機。

【請求項 2】 前記ヒートシンクを前記補助室外熱交換器の放熱フィンに熱結合させてなることを特徴とする請求項 1 記載の空気調和機。

【請求項 3】 前記補助室外熱交換器の熱交換容量を前記室外熱交換器の半分以下にしてなることを特徴とする請求項 1 記載の空気調和機。

【請求項 4】 前記各開閉弁に逆止弁または電磁弁を用いてなることを特徴とする請求項 1 記載の空気調和機。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、室外機に設けた補助室外熱交換器を、インバータ制御回路のヒートシンクの排熱を利用して加熱し、暖房運転時の熱交換量を増大することができる空気調和機に関する。

## 【0002】

【従来の技術】従来の空気調和機は、例えば図 4 に示すように、圧縮機 1、四方弁 2、室外熱交換器 3'、膨張弁 4、室内熱交換器 5' を順次連結して冷凍サイクルが構成されている。上記構成により、図 4 中、実線矢印は暖房運転時の冷媒の流れ方向を示し、破線矢印は冷房運転時の冷媒の流れ方向を示している。上記の空気調和機において、暖房運転時に、室外機における圧縮機 1 より吐出された高温高压のガス冷媒は、四方弁 2 を通過した後、室内熱交換器 5' を流れる間に室内空気と熱交換することで、凝縮液化され室内に熱を放出し凝縮する。凝縮し液化した液冷媒は、膨張弁 4 を通って減圧され、低温低压の気液二相となり、室外側熱交換器 3' を流れる間に室外空気より吸熱して蒸発し、低温低压のガス冷媒となり四方弁 2 から圧縮機 1 へ戻される。冷房運転時は、四方弁 2 を切換えることにより、室外、室内熱交換器 3'、5' の作用が逆になる他は、暖房の場合と同じである。

【0003】しかしながら、上記構成において、暖房運転時、室外側熱交換器 3' を流れる冷媒の蒸発作用は、室

外空気との対流のみによって行われているため、室外機での熱交換量を増大させることが困難であった。

## 【0004】

【発明が解決しようとする課題】本発明は、上記問題点に鑑みなされたもので、室外熱交換器と直列に補助室外熱交換器を設け、この補助室外熱交換器をインバータ制御回路のヒートシンクの排熱を利用して加熱し、暖房運転時の熱交換量を増大することができる空気調和機を提供することを目的としている。

## 【0005】

【課題を解決するための手段】本発明は上記の課題を解決するためなされたもので、圧縮機と、四方弁と、室外熱交換器と、膨張弁と、室内熱交換器とを順次連結し冷凍サイクルを構成し、前記圧縮機および室外熱交換器等を収容する室外ユニット内に、同圧縮機の駆動を制御するインバータ制御回路を備え、同インバータ制御回路を構成するパワーモジュールと、同パワーモジュールに熱結合したヒートシンクとからなる空気調和機において、前記室外熱交換器と前記膨張弁との間に、補助室外熱交換器と第 1 開閉弁を直列接続するとともに、前記室外熱交換器と前記補助室外熱交換器との間と、前記第 1 開閉弁と前記膨張弁との間に、第 2 開閉弁を介してバイパス路を接続する一方、前記ヒートシンクを前記補助室外熱交換器と熱結合させた構成とし、暖房運転時に、前記第 1 開閉弁を開き、前記第 2 開閉弁を閉じ、冷房運転時に、前記第 1 開閉弁を閉じ、前記第 2 開閉弁を開くように制御する構成となっている。

【0006】また、前記ヒートシンクを前記補助室外熱交換器の放熱フィンに熱結合させた構成となっている。

【0007】また、前記補助室外熱交換器の熱交換容量を前記室外熱交換器の半分以下にした構成となっている。

【0008】また、前記各開閉弁に逆止弁または電磁弁を用いた構成となっている。

## 【0009】

【発明の実施の形態】本発明の実施の形態を実施例の添付図面に基づいて詳細に説明する。図 1、図 2 および図 3 において、1 は圧縮機、2 は圧縮機 1 より吐出する冷媒の流れを暖房運転、冷房運転等に合わせて切換える四方弁、3 は室外熱交換器、4 は膨張弁、5 は室内熱交換器でこれらを順次連結して冷凍サイクルを構成している。

【0010】前記圧縮機 1 および室外熱交換器 3 などを収容する室外ユニット 10 内に、室外送風機 11 と、前記圧縮機 1 の駆動を制御するインバータ制御回路 14 を備え、同インバータ制御回路 14 を構成するパワーモジュール 12 と、同パワーモジュール 12 に熱結合したヒートシンク 13 とから室外ユニット 10 が構成されている。

【0011】前記室外熱交換器 3 と前記膨張弁 4 との間

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に、補助室外熱交換器6と第1開閉弁7を直列接続するとともに、前記室外熱交換器3と前記補助室外熱交換器6との間と、前記第1開閉弁7と前記膨張弁4との間に、第2開閉弁8を介してバイパス路9を接続する一方、前記ヒートシンク13を前記補助室外熱交換器6の放熱フィン6a(6bは伝熱管)とを熱結合させた構成となっている。また、前記補助室外熱交換器6の熱交換容量は、前記室外熱交換器3の $1/2 \sim 1/3$ の小容量とした構成となっている。なお、前記各開閉弁7および8に逆止弁または電磁弁を用いた構成となっている。

【0012】上記構成において、暖房運転時に、前記第1開閉弁7を開き、前記第2開閉弁8を閉じ、冷媒は実線矢印で示すように流れる。前記圧縮機1より吐出された高温高压のガス冷媒は、四方弁2を通過した後、室内熱交換器5を流れる間に室内空気と熱交換することで、凝縮液化され液冷媒となり、この液冷媒は膨張弁4により膨張し、第1開閉弁7を通過した後、前記補助室外熱交換器6および室外熱交換器3に送られ、室外空気より吸熱して蒸発し、ガス冷媒となり四方弁2から圧縮機1へ戻される。この時、補助室外熱交換器6は、前記

【0013】冷房運転時は、前記第1開閉弁7を閉じ、前記第2開閉弁8を開き、冷媒は破線矢印で示すように前記バイパス路9側を流れ、前記四方弁2を切換えることにより、室外熱交換器3および室内熱交換器5の作用が逆になる他は、暖房運転時の場合と同じである。

【0014】以上説明したように、前記室外熱交換器3と前記膨張弁4との間に、補助室外熱交換器6と第1開閉弁7を直列接続するとともに、前記室外熱交換器3と前記補助室外熱交換器6との間と、前記第1開閉弁7と前記膨張弁4との間に、第2開閉弁8を介してバイパス路9を接続する一方、前記ヒートシンク13を前記補助\*

\* 室外熱交換器6の放熱フィン6aとを熱結合させ、排熱を利用した構成とすることにより、暖房運転時の熱交換量を増大することができる空気調和機となる。

【0015】

【発明の効果】以上のように本発明によれば、室外熱交換器と直列に補助室外熱交換器を設け、この補助室外熱交換器をパワーモジュールからの発熱を放熱するヒートシンクと熱結合させ、この排熱を利用することにより、暖房運転時の熱交換量を増大することができる空気調和機となる。

【図面の簡単な説明】

【図1】本発明による空気調和機の冷凍サイクルの構成図である。

【図2】本発明による室外ユニットの概略断面図である。

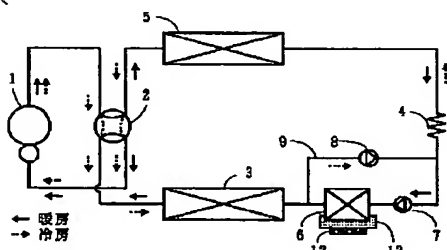
【図3】本発明の実施例を示す要部拡大斜視図である。

【図4】従来例による空気調和機の冷凍サイクルの構成図である。

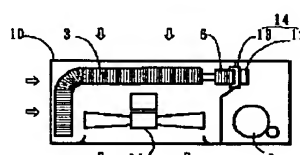
【符号の説明】

- |    |                  |
|----|------------------|
| 1  | 圧縮機              |
| 2  | 四方弁              |
| 3  | 室外熱交換器           |
| 4  | 膨張弁              |
| 5  | 室内熱交換器           |
| 6  | 補助室外熱交換器         |
| 7  | 第1開閉弁(逆止弁または電磁弁) |
| 8  | 第2開閉弁(逆止弁または電磁弁) |
| 9  | バイパス路            |
| 10 | 室外ユニット           |
| 12 | パワーモジュール         |
| 13 | ヒートシンク           |
| 14 | インバータ制御回路        |

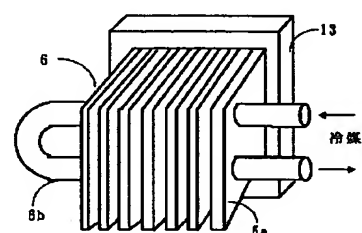
【図1】



【図2】

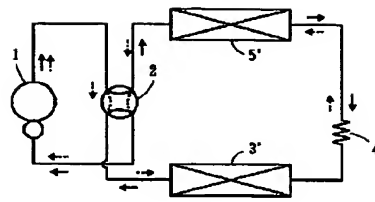


【図3】





【図4】



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